REMARKS

Applicant thanks the Examiner for the thorough examination of the application. It is believed that no new matter is added to the application by this Amendment.

Entry Of Amendment

Entry of this Amendment under 37 C.F.R. §1.116 is respectfully requested because it places the application in condition for allowance. Alternatively, entry is requested as placing the application in better form for appeal by removing the claim amendments that led to the rejection under 35 U.S.C. §112, first paragraph.

Status Of The Claims

Claims 1-11 and 13-31 are now present in the application. Claims 1, 22, 30 and 31 are independent claims. Claims 1, 22, 30 and 31 have been amended to remove the limitations added in the Amendment filed July 5, 2005.

Rejection Under 35 U.S.C. §112, First Paragraph

Claims 1-11 and 13-31 have been rejected under 35 U.S.C. §112, first paragraph as failing to comply with the written description and enablement requirement. Applicant traverses.

In the Office Action the Examiner asserts that the amendments to claims 1, 22, 30 and 31 presented in the Amendment filed July 5, 2005 are neither supported nor enabled. Although the Applicant does not accede to the Examiner's position, these amendments to claims 1, 22, 30 and 31 have been instantly removed, thus rendering this rejection moot.

This rejection is overcome and withdrawal thereof is respectfully requested.

Rejections Under 35 U.S.C. § 103

Claims 1, 2, 5-9, 11,13, 15, 16, 20-22, 24 and 28-31 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,771,110 to Hirano et. al. (Hirano) in view of U.S. Patent No. 6,133,145 to Chen (Chen). Claims 10, 17-19 and 25-27 stand rejected over Hirano and Chen as applied to claims 1, 7, 22 and 30 and further in view of U.S. Patent No. 5,968,847 to Ye et al. (Ye). Claims 3, 4, 14 and 23 stand rejected over Hirano and Chen and further in view of JP 361002368 to Muraguchi et al. (Muraguchi). These rejections are respectfully traversed.

The Present Invention And Its Advantages

The present invention pertains to a method for patterning a metal layer in a semiconductor device in which the plasma etch rate can be twice as high as in the conventional art (specification at page 7, lines 7-8). This novel result is obtained, in part, by depressing the binding force of the metal layer. That is,

if hydrogen gas reacts with oxygen in an indium-tin oxide (ITO) metal layer, water forms to leave only indium, thus reducing the binding force (specification at page 6, lines 16-21).

The invention has many embodiments, and a typical embodiment can be found in instant claim 1:

> 1. A method of manufacturing a liquid crystal display device, comprising:
> forming a switching element on a substrate;
> forming a passivation layer over the substrate;
> depositing a metal layer on the passivation layer;
> forming a photoresist pattern on a surface of the metal layer, such that an upper portion of said metal layer is exposed;
> treating the exposed portion of said metal layer with a first plasma, prior to any step of etching said photoresist pattern, and prior to any step of etching said metal layer, thereby lowering an internal binding force in the exposed portion of said metal layer to increase a subsequent etch rate of said metal layer; and
> etching the treated portion of said metal layer to form a pixel electrode, wherein said depositing a metal layer on the passivation layer, forming a photoresist pattern, and treating the exposed portion of said metal layer are sequentially performed.

Distinctions Of The Invention Over Hirano, Chen, Ye and Muraguchi

None of the applied art teaches or suggests reducing the binding force in the metal layer so as to enhance the etch rate.

Hirano pertains to a method of manufacturing a liquid crystal display device that includes etching a portion of a metal layer to form a pixel electrode. Hirano fails to disclose reducing the binding force in the metal layer so as to enhance the etch rate.

In the Office Action mailed February 3, 2005 (relied upon by the Examiner), the Examiner unequivocally admits to certain failures in Hirano, including the failure to disclose treating the exposed portion of the metal layer with a first plasma prior to etching (Office Action of February 3, 2005 at page 2, lines 21-22). The Examiner then turns to Chen. Chen at column 4, lines 16-24 describes a plasma treating during reactive ion etch (RIE) in a nitrogen atmosphere. At page 3, lines 2-5 of the Office Action of February 3, 2005, the Examiner posits a fundamentally different etch control mechanism than that of the present invention:

> It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the treating method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29-35 and column 4, lines 17-24.

However, the present invention does not modify the properties of the resist. In contrast, the present invention modifies the properties, i.e., binding force, of the metal layer. That is, Chen at column 1, lines 29-35 describes using plasma to modify the "photoresist shape." As a result, adapting the plasma of Chen to modify the metal impermissibly changes the principal of operation of Chen. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the

claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

At page 3, lines 7-14 of the Office Action of February 3, 2005, the Examiner then asserts that lowering the internal binding force in the metal layer is a result effective variable and is a necessary result of combining Chen with Hirano. By this, the Examiner tacitly admits that the combination of Chen with Hirano fails to fairly disclose or suggest each and every element of the independent claims. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All the words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

As a result, one having ordinary skill in the art would not be motivated by the teachings of Hirano and Chen to produce the invention of independent claims 1, 22, 30 and 31. A *prima facie* case of obviousness has not been made. Claims depending upon claims 1, 22, 30 and 31 are patentable for at least the above reasons.

Further, the examiner turns to Ye for teachings pertaining to hydrogen bromide and methane as plasma gases. The Examiner turns to Muraguchi for teachings pertaining to treating with a reactive gas. However, these teachings

of Ye and Muraguchi fail to address the deficiencies of Hirano and Chen in suggesting a claimed embodiment of the invention. A *prima facie* case of obviousness has thus not been made over any combination of the applied art.

These rejections are overcome and withdrawal thereof is respectfully requested.

The Drawings

The Examiner has found the drawing figures to be acceptable in the Office Action mailed March 15, 2004.

Foreign Priority

The Examiner has acknowledged foreign priority and receipt of the priority document in the Office Action mailed March 15, 2004.

Conclusion

Applicant considers all of the Examiner's comments to have been addressed and all of the Examiner's rejections overcome, thereby placing all claims pending in the present Application in condition for allowance. Accordingly, a Notice of Allowability is solicited in earnest.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a two (2) month extension of time for filing a reply in connection

with the present application, and the required fee of $450.00 is attached hereto.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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